

ON METAPHYSICS AND METHOD, OR HOW TO READ FRANCIS BACON'S NOVUM ORGANUM

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The purpose of this paper is to offer a preliminary survey of one of the most widely discussed problems in Bacon's studies: the problem of the interplay between the speculative (i.e., metaphysical) and operative (i.e., methodological) layers of Bacon's works. I propose to classify the various answers in three categories. In the first category I place attempts claiming that Bacon's inquiries display his appetitive metaphysics. In the second category are those seeing Bacon's more "scientific" works as disclosing some of the inner metaphysical layers and presuppositions. The third category see Bacon's experimental inquiries as attempts to "fix" metaphysics, by redefining concepts of metaphysical origins. In discussing these three categories of interpretative stances I show that we can gain further insights if we take into account recent and less recent trends in philosophy of science, and especially if we think in terms of background theory and bottom-up strategies of concept formation. I offer examples of such procedures in Bacon's natural and experimental histories and show what we can gain if we apply the same interpretative strategy of focusing on concept-formation to the reading of the *Novum organum*.

Keywords: Francis Bacon, metaphysics, method, induction, concept-formation, *Novum organum*

О МЕТАФИЗИКЕ И МЕТОДЕ, ИЛИ КАК ЧИТАТЬ «НОВЫЙ ОРГАНОН» ФРЭНСИСА БЭКОНА

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В данной статье рассматривается широко обсуждаемая проблема взаимодействия между спекулятивным (т.е. метафизическим) и операциональным (т.е. методологическим) пластами бэконовской философии. Я предлагаю разделить различные решения этой проблемы на три категории. К первой категории я отношу работы, в которых полагается, что практика бэконовских исследований является отражением его динамической метафизики. Ко второй категории относятся те, кто считает, что более «научные» работы Бэкона раскрывают некоторые внутренние метафизические слои и presuppositions его философии. Третья категория рассматривает экспериментальные исследования Бэкона как попытки «исправить» метафизику, переопределив понятия метафизического происхождения. Обсуждая эти три вида интерпретаций, я показываю, что именно третье направление интерпретации является наиболее плодотворным для более глубокого понимания сложного процесса построения теории в естественной и экспериментальной истории Бэкона. Этот тезис будет проиллюстрирован



на примерах «восходящей» стратегии формирования понятий в «Новом Органоне».

Ключевые слова: Фрэнсис Бэкон, метафизика, метод, индукция, формирование понятий, *Novum organum*

Introduction

A relatively widespread direction of interpretation in current scholarship holds that one can distinguish, in Francis Bacon's works, not one but two parallel philosophical projects: a highly speculative philosophy of nature, grounded on a vitalist, appetitive matter theory, and a quite distinct methodology of knowledge production, generated by Bacon's new "instrument" for the invention of science, "the new organon". This view partly originated in the pioneering work of Graham Rees, the scholar who did so much to unearth what is now known as Bacon's "speculative philosophy". Rees famously claimed:

Francis Bacon's natural philosophy may be viewed as a single philosophy with two aspects or as two philosophies each with its own peculiar character. Either way it is useful to acknowledge that there is a doubleness to his philosophical enterprise: on the one hand, Bacon's philosophy offers itself to us as a program for constructing a body of scientific knowledge that was supposed to yield immense practical benefits and so release the human race from material privation. On the other hand, it manifests itself as a rather strange corpus of speculative science. In its first guise Bacon's philosophy shows itself as a set of methodological recommendations [...]. In its second manifestation Bacon's philosophy comprehends a complete but provisional system of speculative science [Rees, 1996, p. 121].

This interpretation has been taken as a starting point by many scholars, including myself; and it has guided, to a certain extent, most investigations regarding Bacon's complex inter-relation between the highly speculative and the more down-to-earth, hands-on aspects of his investigations. And yet, this characterization in terms of a doubleness of aspects is not unproblematic. If we take Bacon's project to be the edification of a new philosophical synthesis grounded on a particular matter-theory, the method of the *Novum organum* looks unnecessarily ambitious. Does one really need the whole machinery of the intellect deployed in the *Novum organum* if what one wants is to merely justify speculative philosophy? On the other hand, if we take the main project to be the edification of a new method for knowledge production – the method of the *Novum organum* – speculative philosophy looks like a lingering remnant of the past, a bag of presuppositions that Bacon cannot get rid of. For the past decades, scholars were struggling with this conundrum; and the problematic relation between metaphysics and method has generated a large body of literature.



In this paper, I offer a broad and preliminary survey of this corpus for which I propose a tripartite classification. I include in the first category interpretations which take Bacon's methodological and experimental investigations to be mere illustrations of his appetitive matter theory. The second category contains interpretations which assume that methodology "discloses metaphysics". Proponents of such interpretation consider that Bacon's speculative philosophy is foundational but often implicit, and that one can read his experimental inquiries as so many attempts to bring to the surface hidden metaphysical presuppositions. The third category contains interpretations which reveal an intricate interplay between speculative layers and experimental investigations in ways we can perhaps describe as "fixing metaphysics". Proponents in this camp look for feed-back loops which allow Bacon to refine and redefine the terms and concepts that initially belonged to metaphysics but gradually became "technical terms", elements of a novel scientific vocabulary. In this interpretation, the interplay between metaphysics and method takes place at the level of concept formation; and in this process metaphysical assumptions are "tested" and fixed; intermediate explanations are formulated, and novel concepts get defined. My general claim in this paper is that each of these directions of interpretation had merits, at one point or another; and that it is worth looking at the rich and complex interplay between metaphysics using all the methodological and epistemological tools available. Meanwhile, if we are interested in furthering our understanding of the complex process of theory construction which takes place in Bacon's natural and experimental histories, it is the third interpretative direction that is most fruitful. In the last two sections of this paper, I illustrate this claim with several examples of concept-formation and I also show how the reader of the *Novum organum* can benefit from taking this interpretative stance.

Displaying Metaphysics: Illustrating the Workings of the Spirits

A significant number of scholars have claimed in the past decades the primacy of Bacon's appetitive metaphysics over his method¹. This is how Guido Giglioni has recently characterized Bacon's project:

In the *Novum organum* (1620), Bacon intimated that a natural history of the principal motions of matter (*materiae primae passionis ac desideria*) should accompany the "history" of bodies. More precisely, Bacon

¹ A relevant list would include Graham Rees, Silvia Manzo, Guido Giglioni, Sophie Weeks, Doina Cristina Rusu. But, as I will show in what follows, their positions are quite different, and so is what they mean by Bacon's appetitive metaphysics.



presented a view of nature in which matter was deemed to be ruled by eighteenth different appetites for life that were incessantly battling against one deeper appetite for death. It is a fascinatingly speculative section in Bacon's famous work, with resonances of Stoic and Epicurean materialism. And yet, in traditional accounts of Bacon's philosophy, this part of the *Novum organum* tends to be expunged and diluted, so that methodological directions for the study of nature can still be rescued from the choking coils of evil metaphysics [Gigliani, 2016b, pp. 61–62].

The reasons for what Gigliani claims was a distorted view of Bacon are to be found in the peculiar manner his writings were received by the seventeenth century “experimental philosophers”. While trying to make Bacon the father of the new science, the *virtuosi* of the Royal Society had to do a substantial amount of selective reading, attempting to detach metaphysics and method, adopting the latter and obliterating the former; a move propagated further into the later centuries of the European modernity [Gigliani, 2013, pp. 27–54]². Gigliani's erudite reconstructions of Bacon's metaphysics can be seen as an attempt to counteract this move and put things right. The emerging picture of Bacon is that of a speculative philosopher deeply embedded in the tradition of Renaissance vitalism; in fact, it is a picture of a philosopher whose main interest is to understand and manipulate “life”. Gigliani claims that, for Bacon, the purpose of philosophy is to preserve life in natural bodies, in a universe where each part of matter is endowed with appetites [Gigliani, 2016a, pp. 1–39, 5]. What looks *prima facie* as an experimental part of the program is thus merely its operative side serving to uncover, bring to light and illustrate the main tenets of the appetitive metaphysics. What about Bacon's method, the *interpretation naturae*? True to his integrative hermeneutics, Gigliani makes *inductio* another inner tendency of Bacon's teleologic universe. Human mind is also a form of appetitive matter; and its operations are grounded in the same universal tendency of self-preservation that one can find in each part of the universe.

The foundation of knowledge is material motion, an atomic, appetitive tendency to satisfy an immediate urge, and the material motion *par excellence* is any form of inductive inference whereby individual appetites turn into appetites of universal knowledge. Here it is important to keep in mind that induction remains a tendency that is an essential part of the very appetitive nature of matter. The inductive tendency towards the fulfilment of increasingly comprehensive ends is itself ‘interested’, for the idea that

² This view has been questioned lately in a number of papers which trace the adoption of various elements of Bacon's speculative theory to the works Ralph Austen, John Evelyn, John Beale etc. See for example [Matei, 2018, pp. 530–549], [Jalobeanu and Matei, 2020, pp. 542–561]. For a more general assessment of the reception of Bacon's natural and experimental history in the seventeenth century see [Ansey, 2014, pp. 103–132; Ansey and Jalobeanu, forthcoming].



there could be a disinterested urge to contemplation in nature is completely foreign to Bacon's universe, on every level of the philosophical progression from perception to learning. If induction were not a kind of appetitive tendency itself, the enterprise of 'restoring' knowledge and life would end in a limbo of dreams and unfulfilled expectations. [Giglioni, 2016a, p. 5]

In Giglioni's view Bacon has one single, unified philosophy of nature; his method and his experimental investigations are simply unfolding from it. It is a compelling and comprehensive interpretation; but also, one which makes Bacon a curiously dogmatic philosopher. All the wonderful curiosity and ingenious questions one can find in his natural and experimental histories are fading in the background, re-interpreted in a pedagogical and rhetorical register as belonging to various strategies of persuasion. They are not open questions anymore, but parts of the general manipulation of appetites, a "politics of power", which Giglioni sees as characteristic of Bacon's "constitutively theologico-political" philosophy. [Giglioni, 2010b; Giglioni, 2016a]

Silvia Manzo also offers an integrative view of Bacon's philosophy in which there is a primacy of metaphysics over method. Central for this reconstruction is Bacon's concept of law. Manzo sees Bacon's system as unfolding from a number of principles, constitutive of his *philosophia prima* and with correspondents in each of the sciences [Manzo, 1996; Manzo, 2006b; Manzo, 2012]. These principles are not constructed bottom-up; in fact, not much is bottom-up in Bacon's investigations which, for Manzo, display powerful metaphysical commitments and illustrate his appetitive metaphysics of matter. Meanwhile, unlike Giglioni, Manzo also claims that Bacon's metaphysics evolves over time, from earlier commitments more favorable to atomism to later more sophisticated views of a pliable and flexible matter, as illustrated in the *Novum organum* and later writings. What is the cause of this evolution? [Manzo, 2001; Manzo, 2003; Manzo, 2006a] Manzo points to a diversification of philosophical influences, and to an attempt to harmonize diverging sources. She does not seem to acknowledge the possibility that Bacon changed his mind as a result of questions emerging from experimental investigations [Manzo, 2016].

I suggest we can take Giglioni's and Manzo's approaches as illustrative for two important interpretative trends in Bacon studies: an integrative, systematic trend³ and an evolutionary trend⁴. It is not so much that for Giglioni and Manzo metaphysics comes first (albeit in different man-

³ The systematic, static approach can be found already illustrated by James Spedding, Bacon's nineteenth century editor, who emphasizes, time and again, as a characteristic of Bacon's thought, the recirculation of the same themes and ideas. Systematic, non-diachronic approaches can also be found, among others, in the works of Marta Fattori and Sophie Weeks. See [Fattori, 2012; Weeks, Francis Bacon's Science of Magic, 2007].



ners). A more accurate description would be to say that for them there is little else in Bacon beyond the metaphysics of appetitive matter. The new “machinery of the intellect” is simply integrated into it; and what looks like experimentation is merely a process of illustrating the hidden and fundamental motions, appetites and configurations of matter.

Another interpretation which asserts the primacy of Bacon’s metaphysics is the one proposed by Sophie Weeks. Weeks also subsumes method and experimentation to Bacon’s speculative system which, in turn, is grounded on a theory of appetitive matter. This time, however, the unifying trait of matter and metaphysics is a science of magic. i.e., the operative metaphysics directed towards the production of *novae*. According to Weeks, Bacon’s magic constrains “nature’s uncontrolled and unstructured power” [Weeks, 2007, p. 96] and she suggests that one can see this at work in the *Novum organum*; which makes method a part of the science of magic. As a result, the successive steps of the *inductio* read as a set of manipulative procedures for the reconfiguration and the purification of the mind and matter. Weeks also aims to integrate what looks like experimental investigations into the same picture. On the one hand, experiments of light acts as clues and guides through the labyrinth of nature. They have a corrective function and they also enrich the experiential basis, the natural history. But, according to Weeks, they do not produce knowledge; they have, at best, a subordinate and preliminary role. On the other hand, experiments can also be seen as operative extensions of axioms, and, as such, parts of magic.

The Interpreter ascends to an axiom; if the axiom is true it will specify new particulars – it will extend to the discovery of *nova*. An axiom (for Bacon) is a way of expressing nature’s fecundity in philosophical doctrine [Weeks, 2007, pp. 196–197].

Scholars who unearthed Bacon’s appetitive metaphysics have contributed enormously to our knowledge of Bacon’s texts. They have persuasively shown how sophisticated his writings are; and how we should pay continuous attention to the intricate interplay of humanist erudition, imaginative heuristic and high-rank powers of philosophical synthesis so characteristic of Bacon’s views. Meanwhile, in all these interpretations that emphasize the primacy of metaphysics over method, Bacon looks very much like a traditional speculative philosopher who uses natural history to build up forms of experience preliminary to and corrective for the true method of knowledge production. In this interpretation, natural and experimental history serves as an experiential basis, a corrective for the mind and a large store of illustrations and examples of the appetitive metaphysics. Although this is not entirely false and in at least some cases

⁴ The evolutionary trend can also be seen in the works of Paolo Rossi. See [Rossi, 1968].



Bacon's natural historical projects can serve such a function, I think this interpretation is incomplete because it loses sight of some of the most interesting aspects of Bacon's creative and sophisticated experimentation.

And there is something else: in these interpretations one often wonders what made Bacon come up with one idea rather than another. If what Manzo claims it is true and Bacon abandoned atomism in favor of a pliable matter theory, what made him undergo such a switch? It was clearly not something resulting from working in the laboratory, since experiments (where they exist) merely illustrate metaphysics. Thus, one is left to choose from a monolithic interpretation according to which Bacon never changed his views, and one in which some changes occurred for reasons difficult to pinpoint; for reasons which could have been as contingent as the exposure to a new set of ideas, or the reading of a new book.

Disclosing Metaphysics: Theory-Ladenness and the Lakatosian Model

Another set of interpretations treats the relation between metaphysics and method in terms of various forms of theory ladenness. Although still affirming the primacy of metaphysics in the construction of Bacon's system, these interpretations tend to conceptualize the process of knowledge-production in hypothetico-deductive ways. For them, Bacon's metaphysics forms the core of theoretical presuppositions of non-empirical origins and of an often tacit nature which are gradually disclosed in Bacon's natural and experimental investigations. Graham Rees did over the years a fantastic job at uncovering this speculative core, showing both its allegiances to earlier systems and ideas as well as its originality. Rees' Bacon comes out as an eclectic, but also original figure, a philosopher with special skills in systematizing, transforming and giving new meanings and new functions to borrowed materials. According to Rees, Bacon's speculative philosophy is centered on a matter-theoretically driven cosmology which permeates all his views and all his projects. This metaphysical core has at least two layers⁵: an inner layer, composed of the basic stances of the pneumatic matter-theory: claims relating to the fact that bodies are composed of two kinds of substance, tangible and pneumatic. Another part of this inner layer relates to Bacon's beliefs in a "sandwich model" of the universe with the tangible and cold earth in the middle and layered regions of "mixtures" and composites (of tangible and pneumatics)

⁵ Initially, Rees only worked with an inner core of Bacon's speculative matter-theory, what he called the pneumatic theory; but gradually, over the years, Rees developed this theoretical core, ascribing it layers and a complex structure. See [Rees, 1977, pp. 110-125; Rees, 1996, pp. 121-145].



until the fiery region of the sky [Rees, 1979]. Rees showed how on this initial (presumably *a priori* metaphysical core)⁶ Bacon constructed supplementary layers of tentative theories of a highly speculative nature. In Baconian terms, these are “anticipations of nature”, i.e., theories resulting from tentative hypotheses and educated guesses, theories not yet tested, and not properly obtained through *inductio*. Rees claims that an example is the theory of the two quaternions: the “sulphur quaternion” and the “mercury quaternion” – the two “families of things” described in antithetical terms. This theory represents a different layer than the basic core of the tangible-pneumatic matter theory; it has a different set of concepts, a phenomenological vocabulary of an intermediate nature, aiming to bridge the gap between deeper metaphysical layers and the appearances one can empirically investigate.

There be two great families of things. You may term them by several names; sulphureous and mercurial, which are the chemist’s words (for as for their *sal*, which is their third Principle, it is a compound of the other two); inflammable and not inflammable; mature and crude, oily and watery. For we see that in subterrancies there are, as the fathers of their tribes, brimstone and mercury; in vegetables and living creatures there is water and oil; in the inferior order of pneumatics there is air and flame; and in the superior there is the body of the star and the pure sky. And these pairs, though they be unlike in the primitive differences of matter; yet they seem to have many consents; for mercury and sulphur are the principal materials of metals; water and oil are principal materials of vegetables and animals, and seem to differ but in maturation or concoction: flame (in vulgar opinion) is but air incensed; and they both have quickness of motion, and facility of cession, much alike [...] [Bacon, 1859, p. 459].

As Rees has noted, in formulating this theory Bacon makes ample use of tentative terms and explanations in order to express the tentative character of this level of describing phenomena in terms of the two quaternions. Mark also the attempt to formulate explanations in terms that reach the phenomenal level. Thus, Bacon claims that “mercurial bodies” are watery, crude and non-inflammable, while bodies belonging to the sulphur quaternion are oily and inflammable. Presumably, these qualities are ultimately reducible to structures and configurations of appetites. But when discussing intermediates, the explanation has a different, much more phenomenological structure. As in the quote above, Bacon aims to describe natural processes in terms of transformations taking place either among the levels of one quaternion (as when mercurial substances,

⁶ Rees claims that this metaphysical core can be found relatively early in Bacon’s writings and remains more or less unchanged throughout his lifetime. To this core he adds supplementary theoretical layers of speculative nature and, especially after 1611, more properly constructed anticipations of nature which also take into account empirical observations and experimental work.



through rarefaction, become watery and airy) or in terms of mixtures of substances belonging to both quaternions. The latter is particularly interesting, but also somewhat mysterious. Rees' explanation of it is given in terms of mixtures and combinations: "The intermediates combine the qualities of one member of one quaternion with qualities of the corresponding member of the other quaternion" [Rees, 1996, p. 136]. But in fact intermediates are not really "mixtures", as much as "in-between states, poised between any two antithetical ones" [ibid., p. 137]. One can perhaps say that Bacon's language is confusing in this point because he sometimes talks about air and fire "mixing" in the composition of living spirits; and of juices of plants (for example sap) as a mixture of oily and watery substances⁷. On the other hand, he makes it quite clear that these intermediates are reached through complex processes of pneumatization when spirits "prey" upon tangible parts of bodies and transform them. Thus, intermediates are not mixtures properly speaking; they are rather the results of irreversible processes equivalent with what we would call today chemical transformations. In Rees' views, Bacon's experimental investigations disclose these "intermediates"; but they also test and correct intermediate theories and explanations [Rees, 1985].

If we continue along the lines of Rees' model, distinguishing between an inner metaphysical core of matter-theoretical related assumptions and various layers of anticipations where speculative philosophy meets with experimentation, one is tempted to propose for this process of theory-construction and justification a model similar with that proposed in the 1970s by Imre Lakatos [Lakatos, 1968; Lakatos, 1976]. Following this line of interpretation, I argued in favor of describing the connection between metaphysics and method in these Lakatosian terms: Bacon's theory would be thus a research program having in its core the metaphysics of matter, plus a protective belt of anticipations, while Bacon's method would function as a sort of (negative and positive) heuristics [Jalobeanu, 2010]. However this may be, if one follows Rees one immediately realizes that the problem of the relationship between metaphysics and method has changed. In this view, experiments disclose metaphysical presuppositions and also help to feed-back into the body of anticipations that deal with "intermediates". Rees sees Bacon as making educated guesses regarding the "kind of science the method was expected to create". Ultimately, in this interpretation one can see the machinery of the *inductio* as being directed towards demonstrating and verifying the details of the speculative philosophy.

Other hypothetico-deductive models for understanding the inter-relationships between Bacon's speculative theory and his more experimental work have also been proposed; but it would be fair to say that they did not reach the detail and comprehensiveness of Rees' reconstructions.

⁷ For a discussion see [Jalobeanu, 2018, pp. 459–486].



Mary Hesse and Peter Urbach both insisted on the role of hypotheses, predictions and tests for Bacon⁸. More detailed work has been done to demonstrate the theory ladenness and the sophisticated mechanisms of feed-back and theory construction one can find at the level of Bacon's natural and experimental histories⁹; and to this I would like to turn in the next section of this paper.

Testing and Adjusting: The Background Theory

Contemporary philosophy of science has proposed other models one can use in order to look at the intricate interplay between theory and experimentation; and some of them can be of use if we think of what Bacon was attempting to do. In my book, I treated speculative philosophy as a background theory against which the Baconian program was developed [Jalobeanu, 2015; Jalobeanu, 2016b]. After all, Bacon's speculative theory is just a brand of a larger group of vitalist matter-theories. As Bacon scholars have amply shown, Bacon's matter theory is highly eclectic, bearing similarities with the theories of Telesio, Cardano, Severinus, Giovan Battista della Porta, perhaps also Ficino and Bruno¹⁰. One can take the ensemble of these vitalist theories to constitute a general background theory against which Bacon constructed the intermediate layers of his speculative (and tentative) theories. The advantage of thinking in terms of a background theory is that one does not have to assume that Bacon *first* adopted uncritically a metaphysical core of a-priori presuppositions with respect to the nature of matter and then went on to criticize all received theories for dogmatism, only to reconstruct speculative layers of theoretical explanations of this already assumed metaphysical foundation. Instead, we can simply see him as a philosopher of his time working with some of the philosophical baggage of Renaissance vitalism, adopting provisional hypotheses and tentative explanations which he then subjected to more sophisticated experimental inquiries. Sometimes, this background theory is responsible for the language and questions that eventually guide his research: phenomena are described in terms of spirits and tangible matter; spirits are described in vitalist and appetitive terms, and he often talks about "mixtures" (of watery and oily, of air and fire). One can perhaps also place in the background theory the cosmological hypotheses about the fiery nature of the heavens, the "sandwich-theory" of the at-

⁸ [Urbach, 1987; Urbach, 1982, pp. 113–132; Hesse, 1968, pp. 114–139].

⁹ [Schwartz, 2014, pp. 63–91; Rusu, 2012, pp. 1–2; Anstey, 2012, pp. 11–31; Anstey and Jalobeanu, (forthcoming); Georgescu, 2011, pp. 104–121].

¹⁰ See for example [Giglioni, 2010a, pp. 69–87; Manzo, 2016, pp. 99–117; Garber, 2016, pp. 119–133; Rusu, 2017, pp. 1–35; Rusu, 2020; Rusu and Jalobeanu, 2020, pp. 381–392; Jalobeanu, 2020a, pp. 425–446].



mosphere, and the sulphur-mercury “quaternions”. This background theory provides tools with which one can proceed to the experimental investigation of phenomena. It also guides the investigation, but in a much more flexible way than if it were a metaphysical core or a set of fixed metaphysical assumptions. In this interpretation, one can see Bacon working with a method of investigation (composed of the two branches, the *experientia literata* and the *new organon*) to construct various explanatory theories which eventually clarify, modify and change the conceptual vocabulary and tools that belonged to the background theory. As I have shown in a number of papers, one can see this feed-back loop at work in Bacon’s investigations. Here is one example of this strategy at work in defining extension-related concepts and the elaboration of the explanatory theory of “orbs of virtue”. As I have shown, Bacon begins by assuming that virtues act at set distances – a common element of the background theory [Jalobeanu, 2016a; Jalobeanu 2020c]. This is neutrally formulated in the *Novum organum* in terms of natural limits:

[...] virtues and motions of things operate and work over distances which are neither indefinite nor random, but finite and certain [Bacon, 2004, p. 369].

Meanwhile, Bacon borrowed terms and concepts from the magnetic philosophy of William Gilbert and the natural magic of Della Porta and used them to clarify and extend some of the questions and challenges already contained in Gilbert’s proposal for a *scientia* of the “orbs of virtue”. But in a characteristic manner, Bacon radically transformed the meaning and use of borrowed concepts. I have shown that in discussing various “orbs of virtue” Bacon circumvented some of the thorny debates regarding the nature and mechanisms of actions involved in transmitting various virtues (electric, magnetic, gravitational). Instead, he classified virtues in three categories: short-ranged (such as the electrical), medium-ranged, and long-ranged virtues in operational and instrumental terms. For each virtue

[...] there is a kind of *No further* which varies according to the mass or quantity of bodies, of the strength and weakness of virtues, or the helps and hindrances of the media, all which ought to come into the reckoning and to be noted down [Bacon, 2004, p. 371].

The classification of orbs becomes, thus a subject of experimental investigation. One has to find the right instrument first: and sometimes, as I have shown, Bacon made use of a number of ad-hoc instruments of detection, and instruments of measure [Jalobeanu, 2020b]. With the help of these instruments, one can first detect where the spatial limits beyond which a certain orb does not extend are. A magnetic needle can work as an instrument of detection for the orb of virtue of a particular magnet; and similarly, the porous filament of a “beard of wild oat” can detect



the presence of humidity, i.e., the orb of rarefaction created by a pot of water [Jalobeanu, 2020c]. More accurate instruments can also measure and chart the geometry of a particular orb. With the help of these experimental investigations one can then formulate a preliminary theory which connects the parameters Bacon claims are involved in producing and sustaining any orb of virtue: the quantity of matter involved, the strength of virtue, and the interaction with the “intervening media”. At the end of this investigative enterprise, one obtains an operational concept of “orbs of virtue” which is more than a generalization of earlier, metaphysical concepts [Jalobeanu, 2016a].

In other papers, I have shown that something similar can be reconstructed for other important concepts of Bacon’s scientific vocabulary, such as “concoction”, and *plica-materiae*. Both terms have their origin in the background metaphysics. Concoction is a common term in the Aristotelian and medical tradition, widely used to designate chemical transformation of the “crude” into “digested”, pneumatized material. In the *Sylva Sylvarum*, Bacon undertakes a series of experimental investigations of various phases of this process and formulates an operational definition [Jalobeanu, 2018; Jalobeanu, Matei, 2020]. Similarly, in the *Historia densi et rari*, the metaphysical concept of *plica materiae* which designates the property of matter to be flexible, pliable, and expand in ways that exclude both interstitial and congregated vacuum, is transformed into a condition of continuity. Again, what Bacon does is to formulate an operational definition (under the form of a provisional rule, in the *Canones mobiles* with which he ends the *Historia densi et rari*) [Jalobeanu, 2020b]. Without using the same language and without reference to contemporary trends in the philosophy of science, Silvia Manzo also reconstructed a case of concept formation in Bacon’s theory of simple motions, showing how a cluster of concepts and explanations taken from pneumatics can be seen as a sort of background against which Bacon elaborated his notion of “motion of liberty” [Manzo, 2016]. More precisely, her investigation focuses on possible ways in which Bacon might have read Cardano and exploited his concepts of *attractio* and *impulsus*, while working with almost the same set of experimental investigations into syphons while formulating explanations in terms of the new “motion of liberty”. However, true to her views on the primacy of metaphysics, Manzo treats Bacon and Cardano as working with “the same experiment” and two different explanations instead of seeing how concepts arise from the interlocking array of practices (of setting up experiments and addressing questions).

I think we can learn three things from all these examples. First, that Bacon often acted in an opportunistic manner in formulating intermediate explanations. He introduced new concepts or radically changed the meaning of received concepts, he adopted intermediate axioms as provisional rules (*cannones mobiles*), all for the purpose of better establishing



a particular field of investigation. Second, that in this process, he modified a number of details of his speculative theory. Third, that definitions are essential in this process of theory formation. And here, is, I think, where the *Novum organum* comes into play, as I will show in the concluding section of this paper.

Fixing Metaphysics: The Mechanism of Concept Formation and the Theory of Definitions

As we have seen, defining the objects of investigation is very important for Bacon in his natural and experimental histories. Meanwhile, one can also say that the problem of definition is one of the main problems of the *Novum organum*¹¹. The general challenge of the *Novum organum* is that our notions are badly formed. The first book discusses the various ways in which notions are badly formed and the effects of these distortion upon the workings of the mind. Notions are badly formed for a number of reasons, but some of the most important ways in which this process of concept formation can go wrong are the following¹². First, Bacon claims that mind of man tends to jump to conclusions, operating, as it were, incomplete inductive generalizations. This is how “anticipations of nature” are usually produced. Second, Bacon also claims that notions are badly formed because passions and biases intervene in the process of thinking, distorting the judgment and resulting in fantastic, non-existing, words which do not correspond to “things” in nature, such as celestial orbs, for example. Third, notions are badly formed because we read the wrong books, assimilate them, and then use them as tinted glasses in our own investigations of nature¹³. Last but not least, notions are badly formed because we give them the wrong names – and these names, i.e., idols of the market-place – tend to distort our judgment. In the first book of the *Novum organum* Bacon is quite convincingly persuading us that all notions are badly formed and distorted; and he gives ample examples collected from – as it were – the scientific vocabulary of his day. He claims

¹¹ I am following here mainly the remarkable reconstruction offered by McCaskey, *Regula Socratica: The rediscovery of ancient induction in early modern England*, 2006.

¹² There is a large literature on Bacon’s idols and distortions of the mind and the subsequent medicine of the mind which he intended to develop; but, to date, few scholars have discussed Bacon’s examples of (scientific) concept formation from this perspective. I have tried to discuss on some examples in [Jalobeanu, 2019, pp. 8–36]. See also [McCaskey, 2006, pp. 246–251]. A relevant section of works on the idols would include [Zagorin, 2001, pp. 379–393; Corneanu, 2011; Corneanu, 2016, pp. 201–229].

¹³ These would be of course the idols of the theatre. For Bacon’s attempts to reform the history of philosophy eliminating some of these idols see [Jalobeanu, 2019, pp. 8–36].



that it is mostly because notions are badly formed that the axioms of sciences are wrong¹⁴.

Meanwhile, there is also a sense in which book II of the *Novum organum* is also about definitions and concept formation. As McCaskey has persuasively shown, Bacon revives the “Socratic” notion of *inductio*, i.e., the search for (real) definition. McCaskey reads Bacon’s example of the investigation of the form of heat from the second book of the *Novum organum* in terms of a process of investigation in which one gradually arrives at a definition. In McCaskey’s reading, the project is the following:

Bacon proposes that if one can know the formal cause, or form, of a nature, one can obtain a universal principle. His example is heat. If one can know the form, the essence, of heat, if one’s notion of heat is well-abstracted and well-defined if the notion of heat is not mere idol, then one can know how to ‘generate’ and ‘superinduce’ heat on any body, at any time, anywhere. Bacon proposes a three-step process: a comprehensive natural history, an orderly arrangement of the relevant parts of that history, and finally, a “true and proper induction”. To the *Novum organum*, Bacon appends guidelines on how to collect that natural history and what should be in it. In the *Novum organum* itself, he concentrates on the second and third steps [McCaskey, 2006, p. 260–261].

The “orderly arrangement of the relevant parts” of the natural history of heat involves a complex investigation. And one can approach this investigation via the relevant similarities it presents with Socratic investigations. We see Socrates in Plato’s early dialogues embarking into a pursuit which begins with questions such as “What is virtue?” or “What is courage?” The first step is to identify positive instances of virtuous or courageous men. In Bacon’s example, one lists positive instances of the presence of heat in various phenomena and tabulates them. Then one inquires whether what looks like courage, virtue or heat it is really courage, virtue or heat – and as the Socratic example amply tells us, discovers that it usually is not; that what looks like heat is something else (such as light). Qualities and virtues get confused and are difficult to disentangle. The next step of the inquiry would be to understand what degrees of comparison we can use whether we discuss virtue, courage or the form of heat. The investigation is of course unfinished, and the tables of presence, absence and comparison are extremely meagre and mainly composed of open questions; however, we can distinguish the steps of inquiry. According to McCaskey, this inquiry is clearly directed towards identifying a genus (heat is a kind of motion) and a specific difference (with respect

¹⁴ This incidentally means that book I of the *Novum organum* contains the suggestion of a medicine of a mind as a prerequisite of any kind of knowledge. For more detailed discussions see [Corneanu and Vermeir, 2012, pp. 183–206; Corneanu, 2016, pp. 201–229].



to other kinds of motion) and thus to formulate a good definition, a *notio* which is not plagued by the idols of the mind. As McCaskey puts it

To identify what heat is means to identify the formal cause or form of heat. To do so, one should use an exhaustive process of comparing and contrasting instances of the widest possible variety, first identifying the genus, and then identifying the true differentia. The result will not be an idol but a well-formed notion. With this well-formed notion in hand, the inductive conclusion follows directly [McCaskey, 2006, p. 264].

In this way, we can read the second book of the *Novum organum* as the Baconian theatre of a Socratic-type of investigation aiming at the formulation of a good (i.e., non-idolic) scientific vocabulary. It is in fact what Bacon himself claims:

But the *Induction* to be employed for the discovery and demonstration of the sciences and arts ought to separate a nature out by due rejections and exclusions, and then, after bringing enough negatives to bear, draw conclusions from affirmatives; which is something never yet done or attempted hitherto, except by *Plato* alone who does to some extent use this form of induction for scrutinizing definitions and ideas. But for the fair and lawful fitting out of this mode of induction or demonstration we must supply many things which have not hitherto crossed the mind of mortal man, such that more work must be put into this job that has so far been swallowed up by the syllogism. This induction must moreover be used not only to discover axioms but also to fix our notions [Bacon, 2004, p. 162–163].

In this sense Bacon claims that the *interpretatio naturae* is identical with the working of a mind “freed of impediments”, capable of forming the right notions and construct with them the true axioms of the sciences. This was at least the plan. Where I differ from McCaskey’s interpretation is in assessing the distance between the plan and its fulfillment. The problem with Bacon’s investigation is that it remains at a very preliminary stage. The tables of presence, absence and comparison are not tables, properly speaking, but merely lists of instances, suggestions and ideas. It is curious that most scholars seem to disregard this, or to find it relatively unproblematic; especially considering Bacon’s clear statement:

Anyone can see how poor we are in history from the *Tables* presented above, where, in place of verified history and reliable instances, not only do I sometimes insert traditions and tales (though never without saying when they are of doubtful credit or authority) but I am often reduced to using these phrases: *Perform an Experiment or Investigate further* [*Fiat experimentum, vel Inquiratur ulterius*] [Bacon, 2004, pp. 252–253].

The problem with *Fiat experimentum* is that it has an open-ended character. Therefore, it is highly problematic to assume that a more complete set of tables can be obtained from a sketchier set just by adding in instances according to the initial structure. We know from Bacon’s



other natural and experimental histories that the investigation of classes of phenomena often branches off or changes the categories and the topics of inquiry. One can begin with a list of instances in the table of absence which, under more careful consideration, turn to be instances of presence or even instances of comparison. One can realize that unproblematic instances of presence can turn to be complex cases of confusion between different virtues and qualities. One can also imagine that, like in case of the Socratic investigations, most of the investigations of forms are eventually abandoned. But how about Bacon's "first vintage", or "the form or true definition of heat"? One can see from Bacon's definition that things are rather complex. The definition runs like this

Heat is an expansive motion [*motus expansivus*], but restrained and struggling by way of the lesser parts [*partes minores*] [Bacon, 2004, p. 271].

This might look deceptively modern, but it is not. First, for Bacon almost everything is a kind of motion since simple motions are the basic alphabet of nature. Second, many processes have motions of expansive in their composition – think of rarefaction, for example. Second, in all bodies there are struggling appetites and they all manifest at the level of the smaller parts. The reference to the smaller parts is in itself problematic and sets one thinking of particles; but there is no reason to think that Bacon claims here that heat is equivalent with a motion of particles. The *motus expansivus* is further determined in the definition by adding that we deal with expansion of a particular kind, a sort of non-isotropic expansion "so that in expanding all round, it nevertheless tends to rise upwards". And that the inner struggle characteristic of heat is also of a particular kind, namely that it is "violent" [*cum impetus nonnulo*] and "swift" [*incitatus*]. But although this looks more precise, it is still rather quite loose since most phenomena in Bacon's universe are produced by violent and swift and struggling motions, and some have also preferential directions. One can think of light, or rare, or levity as forms that can be described in very similar terms. The operative part of the definition tries to make things more precise, by specifying how one can produce heat

If in any natural body you are able to excite a dilating or expanding motion [*Motum ad se dilatandum aut expandendum*], and can so repress this motion and turn it back upon itself in such a way that the dilatation does not proceed equally [*non procedat equaliter*] but it is not given its head and now forced to retreat [*sed partim obtineat, partim retrudatur*], then without doubt you will generate heat¹⁵.

Unlike other motions, such as rarefaction, this motion "turns back upon itself"; this looks precise enough, but it is also a property of spirits preying upon matter and producing fermentation or putrefaction; and

¹⁵ *Novum organum* OFB XI 270-1 with some modifications of the translation.



when fruit rot we can see there a local dilatation that “does not proceed equally”. It is only the last part describing the variability of motion which seems to accelerate and then decelerate that one does not find in other processes such as rarefaction or fermentation, but even so one can imagine situations which bear all the features of Bacon’s operative definition and which do not result in heat being produced. Think of chemical reactions, for example, or think of producing soap-bubbles with a machine that flows an unequal current of air into a solution of soap and water, so that the resulting bubbles have different dimensions, shapes, merge into one another etc. Bacon deals with both chemical reactions and soap bubbles in his posthumous *Sylva Sylvarum*¹⁶. He does not describe them at length and does not elaborate on them. In fact, I think it is highly relevant that Bacon never attempts to propose another real definition or another form; and that he does not really use this definition of heat anywhere else in the *Novum organum* (or later works, for that matter).

In conclusion, there seems to be a mismatch between Bacon’s plan and its realization. In theory, things are clear: one begins by sketching the main topics of inquiry for a natural history of heat. These topics are already theory laden, expressed in a technical and metaphysically charged vocabulary: we meet with various “simple motions”, celestial and terrestrial natures, “principal natures” [*naturam principalem*] and so on. My suggestion is that this vocabulary is gradually clarified through experimental procedures and successive changes of meaning, in a feed-back loop between the metaphysical background theory, intermediate levels of speculation and hands-on observation and experimentation. Presumably after the “first vintage” one can get to a second vintage which might be a further clarification of the definition or the formulation of an axiom¹⁷. In this rather complex and often roundabout manner, one obtains two things. On the one hand, one gets a properly formed, non-idolic scientific vocabulary and the true axioms of the sciences. On the other, one “fixes” and amends one’s metaphysics in all its layers (background metaphysics, theoretical speculations, metaphysically informed hypotheses).

Conclusion

The aim of this paper was to give an overview of a complex and much discussed problem: the problem regarding the interplay of metaphysics and method in Bacon’s writings. I have classified the various attempts to

¹⁶ See for example *Sylva Sylvarum* experiments 24, 293 and 395.

¹⁷ As McCaskey [2006, p. 362] emphasizes, Bacon never got to the “second vintage” and does not use this phrase; but the “second vintage” with the sense of “axioms” appears in the *De generatione animalium* of William Harvey.



answer this thorny question in three categories. First, there are those claiming that Bacon's inquiries illustrate and display his speculative and appetitive metaphysics. Second, there are the attempts to discuss more precise ways in which Bacon's more "scientific" works display some of the inner metaphysical layers and presuppositions. I have suggested that we can read these attempts in terms of various recent and less-recent trends in philosophy of science, such as a verificationist stance, a hypothetico-deductive model, a Lakatosian model or a background-theory model. Thirdly, I have shown what we can gain if we pay more attention to the complex process of concept formation we can find at work in Bacon's natural and experimental histories. In this interpretative stance, we can see Bacon's investigations as attempts to "fix" details of metaphysics, through feed-back loops which take an initially metaphysical concept from the background-theory, redefine it, and make it operational in an experimental investigation. In the concluding section of the paper, I have attempted to show what we can gain if we apply this interpretative stance in the reading of the *Novum organum*. We can see that there is a sense in which much of the *Novum organum* reads as part of a larger discussion regarding the establishment of a novel "scientific" vocabulary, a vocabulary made of well-defined concepts.

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